

Measuring Odors From Livestock Operations

Complaints about nuisance livestock odor in rural areas have become a problem nationwide. Scientists for the U.S. Department of Agriculture's Agricultural Research Service are working to find new ways to tackle the smelly dilemma.

James A. Zahn, a microbiologist formerly with the Agricultural Research Service at the National Soil Tilth Laboratory in Ames, Iowa, developed a way to collect air samples for scientific analysis. He is now with Iowa State University.

"There is little basic understanding as to what causes the different odors that are detected around livestock operations," says Zahn. "We can't evaluate methods to control odor until we understand the makeup of the odors themselves."

Zahn devised a mechanical air-sampling device that can be transported to the site where odors

originate. The device uses an absorbing tube and a pump to draw in a specific quantity of air. To date, Zahn has identified more than 200 volatile organic compounds, gases, and airborne particles from samples taken near livestock operations.

The most common method of storing and processing livestock manure—especially hog manure—is by storing it in large lagoons or deep basins. These are anaerobic, or no-oxygen, environments. There, the manure breaks down into organic components including hydrogen sulfide, acids, ammonia, phenols, and indoles, which together create the telltale odor some people call stink.

According to Jerry L. Hatfield, who leads research at the Ames lab, the secret to defusing odors is determining what makes them smelly. So far, 27 different chemicals that create hog manure odors have been identified using Zahn's device. Hatfield

says the laboratory work isn't very popular. "We can duplicate livestock manure odors in the lab," he says. "That doesn't smell very good, but it gives us clues that we are on the right track toward understanding how odors are formed."

The goal of the research, done in conjunction with the National Pork Producers Council, is to find ways to scientifically measure the stink factor in livestock manure and reduce or eliminate it.

There is currently no measurable standard for nuisance odors—only the human nose. "This isn't a replacement for the human nose," says Hatfield, "but it does give us a research tool to quickly and objectively assess odors." Older methods of odor analysis were time consuming, labor intensive, and messy.

The human nose is capable of discerning only one or two odors at a time and can be easily overwhelmed by pungent odors like ammonia, the gaseous nitrogen compound. Individual compounds may not be offensive by themselves, but they could take on offensive traits when mixed.

Detection is only one component of the odor problem. Scientists also monitor weather conditions, air and ground temperature, and soil conditions in and near hog farm manure lagoons and pits to learn more about odor. The results of the research may lead to improved farm management practices to keep odors in check.—
By Dawn Lyons Johnson, ARS.

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Chemist Dick Pfeiffer uses a gas chromatograph/mass spectrometer to analyze compounds in odors collected from a swine production facility.